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Act 5

THE
FUTURE
OF WAR

BY JEAN DE BLOCH



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The
FUTURE OF WAR
IN ITS TECHNICAL
ECONOMIC AND
POLITICAL
RELATIONS

Ivan Stanislawsky BY

JEAN DE BLOCH

TRANSLATED BY R. C. LONG, AND WITH A CONVERSATION
WITH THE AUTHOR BY W. T. STEAD, AND AN
INTRODUCTION BY EDWIN D. MEAD



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1902

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INTRODUCTION

The death of M. Jean de Bloch, which occurred at Warsaw just as the year (1902) began, is a misfortune for the whole world. It is peculiarly so at this immediate juncture; for the imperative problem with the world at this time is how to get rid of war and substitute for it a rational way of settling international differences, and no other man in our time has studied this problem so scientifically or contributed so much to its solution as Jean de Bloch. Indeed, I think it is not too much to say that M. Bloch was the most thorough and important student of the question of War in all its details and upon its many sides who has ever lived, and that his great book upon "The Future of War" will remain the chief armory from which the men of the twentieth century who are warring against war will continue to draw until their sure victory comes, and all national and international disputes are settled in the courts, as to-day personal disputes are settled.

I think that no book ever written in the cause of the peace and order of the world, save Hugo Grotius's great work alone, has rendered or is likely to render such influential practical service as Bloch's "Future of War," supplemented as it has been by his articles in the various reviews during the years since the work was first published. Dante's "De Monarchia," the "Great Design" of Henry IV, William Penn's "Plan for the Peace of Europe," Immanuel Kant's "Eternal Peace," the essays of LaCroix, Saint Pierre, Bellers and Bentham, Sumner's "True Grandeur of Nations,"—these high appeals and such as these have pierced to the hearts of thinking men in the successive centuries, and their general and cumulative effect in ele-

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vating the tone and broadening the outlook of society upon the question of War and its evils has been immense. It would be hard, however, to lay the hand upon any distinct practical reform or progress wrought by any of them in its own day or days that followed. But Grotius's "Rights of War and Peace" wrought almost a revolution, and it did it almost at once. With it, it may be said with a high degree of justice, international law was born into the world almost full grown; and from the time of its appearance war, horrible at its best, has been in its usages a very different thing from what it was before. Equally definite, distinct and practical has been the influence of Bloch's "Future of War"; and I believe that it will be seen at the end of this twentieth century that its influence has been equally powerful and far-reaching.

Bloch's monumental work upon "The Future of War," in six volumes, was published in Russian five or six years ago. It was the result of a decade's special study by this eminent financier and economist, whose whole life's experience had fitted him to understand so well those phases of the question which he felt it most important to emphasize to Europe. Editions of the complete work have been brought out in German and in French, under the distinguished author's own supervision. No edition has yet appeared in English; only this translation of the last volume, in which the conclusions are summarized, has been published for popular use. It is a pleasure, however, to be able to state that the preparation of a complete English edition is about to be undertaken. No library in America or England, no university or college, no editorial room or minister's study should be without it. Meantime it is a satisfaction to know and to assure the public that the present volume contains the gist of the whole work, the clear statement of all its important principles. It will always be the best thing for the ordinary reader, giving all which he requires. I count it a peculiar benefaction that a cheap edition of this work is now given to the public by a publisher whose heart is in it, making it possible for

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all men to possess it and for the friends of peace to circulate it by the thousand. I trust that they will earnestly unite to do it. The Peace cause has suffered because so much of its best literature is not available in attractive and cheap form and is not widely circulated. This need we are assured is now to be effectively met; and the present publication is surely a good beginning.

The matter of really greatest moment in our time for the student of War and the worker for Peace has not been the war in South Africa nor the war in the Philippines, but the Hague Conference. The Hague Conference did not come into existence without ancestry, without intellectual forces which made it imperative and certain. It came not simply because the Czar sent out his Rescript; it was because the Czar himself had been converted, that commanding intellectual forces had been in operation in Russia. I think there was none of these intellectual forces more potent than that exerted by Jean de Bloch. Bloch's book was an epoch-making book. It startled the Czar and his ministers; it startled all serious thinkers in Europe; it was one of the cardinal forces that compelled the Conference at the Hague. At that Conference, in a private and unofficial capacity, Bloch himself was present throughout. He always declined the honor paid him of having suggested the Conference to the Czar by his book; the idea he declared was the result of general evolution, which was forcing upon all serious minds the conviction of the folly and impossibility of continuing the war system.

If ever a man is born under conditions which naturally compel him to think of the tragedies of war, of its horrors and burdens, and of the evils of those race antagonisms which so often lead to war, I think it must be a Polish Jew. The very word Jew brings up the thought of the sufferings, the social and political ostracism, the injustices and wrongs of every sort, which have been the lot of the Jew through all these centuries. The name of Poland reminds us equally impressively of those scarce slumbering hatreds and

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antagonisms there still after a hundred years, a monument to the cruelty and wickedness of the wars which ended Poland's national life, as the close of one of the most mournful and shameful chapters in human history.

Jean de Bloch was a Polish Jew, a poor Polish Jew, beginning his life as a pedlar, hawking his wares about the streets of Warsaw. Finally getting through good fortune a sum of money, he resolved that he would push out of the ignorance and narrowness into which he was born, and he found his way to Berlin. There he studied for three years, largely with French and English tutors, and then went back to Warsaw. He was a man of immense energy and a devoted student. He rapidly acquired a fortune as a banker and also obtained a high reputation as a sociologist and an economist. He married a rich and talented woman, and their home became a notable intellectual centre. He wrote exhaustive works in many volumes upon Russian railways, Russian finance, and Russian local government. It was to him presently that the Russian commercial folk and the Russian government itself were turning to finance their operations. He became the leading banker of Poland—a sort of Polish Rothschild—and he became the president of important railway systems. He was led as a result of all this to understand what were the menaces to the economy of states of the war system obtaining in Europe. Seeing that war lay at the root of the trouble, he devoted himself for years to the preparation of his exhaustive work upon “The Future of War,” the most powerful arraignment of war and the most powerful argument for the peace of the world which has been written in our time, or perhaps in any time. From his youth he had studied war, and he had written many pamphlets on military subjects; but “The Future of War” was his supreme effort.

With that work Bloch came to the Hague Conference. He came, he said, as a learner; but he came also as a teacher and a helper. He came to bring his book, to distribute it, to explain it, and to acquire in-

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formation and education for himself. He sincerely believed that his book was the Bible of this cause. He was not a vain nor an opinionated man, but he had the profoundest confidence in his insight and in the things which he had learned. His argument was, on the whole, and in the place where he laid the emphasis, a new one. The peace societies had in the main appealed to the moral side of this matter; Jean de Bloch appealed to the business side. The appeals of the apostles of peace have been for the most part to the world's humanity and piety; although it would be a mistake and a wrong not to remember that from William Penn's time to Charles Sumner's they have not failed to urge again and again the economic argument and point out what would result if the world would apply to constructive ends what it wastes on war. Jean de Bloch said: We must appeal to the purse, to common sense, and make men see that this war system is the most stupid thing in creation. That was where he directed almost his whole argument. He said that if it came to a great European war, that war could only cease with the annihilation of one combatant and the financial ruin of the other. He said that, so far from this question of an international court being a Utopian thing, it was the men who were going on with their schemes for wars who were really dealing in chimeras; that the time has come when we should apply our resources, not to the things which waste and devastate, but to the things that build up states and the industries and the social welfare of men. He appealed to the facts of war as they unrolled themselves before the eyes of Europe; he showed what the real results of the Franco-Prussian War were; he drew the lessons from the Russo-Turkish War. The destructiveness of modern warfare, with its frightful new weapons, becomes so appalling that a general European war would bring the universal bankruptcy of nations. The present armed peace, indeed, is so costly that the burdens of it already threaten social revolution in almost every country in Europe.

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Bloch, unlike most peace men, was one of the most critical students of military affairs; he met the military men upon their own ground. He lectured last summer to the United Service Institution in London, a body of military experts, with a major-general in the chair; and he proved himself the superior of those practical and learned military men upon every technical point, and worsted them in the debate.

In the last years of Bloch's life he was engaged chiefly in drawing from the South African War the warning lessons which the world needs to learn. He has shown that the Boers have been so successful not, as has been often said, because of the topography of the country or because they are particularly good marksmen, but because they have profited by the utterly changed conditions of war. Bloch shows that the fundamental change came in with the American Civil War. The American Civil War, he was never tired of telling the people of Europe, settled it that the alleged superiority of disciplined armies over volunteer troops amounts to nothing; that the ordinary military training is often a positive disadvantage in preparing for modern warfare. War is no longer the clash of solid phalanxes with solid phalanxes in showy, heroic combat upon battlefields. Cavalry and artillery are rapidly becoming useless. Soldiers cannot be compacted, but must be spread apart, and each must rely upon himself as never before. One man in defence is a match for ten in offence; the methods of guerilla warfare become more and more common and necessary; and the civilian soldier, the simple volunteer, is as good as the regular, and often better.

This is a thing of immense moment; for if it is true it makes the whole effort to maintain great armaments a vain thing. Robert Peel said with discernment that, instead of wasting the resources of a country to maintain great armies and navies, the sensible nation in the future will rely upon its own latent energies, perfectly sure that if it has inherent energy it can always improvise powers necessary for any de-

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fence at very short notice. There is no practical demand or excuse longer for costly armies and navies; all this great armament is waste. Bloch has shown that thing to the modern world,—that from the scientific point of view armies and navies are not a source of strength to any nation, but rather a source of weakness; that they do not defend, but rather drain and endanger. He has not been answered; I do not believe he can be answered. We are his debtors,—the foolish and long-suffering world is his debtor,—for the thoroughness and power with which he has taught this great lesson.

“The Future of War” was but the culmination of M. Bloch’s remarkable activities in his life’s campaign for peace and an organized world. His articles in the reviews and magazines—Russian, French, German and English—were innumerable. His impressive article upon “Militarism in Politics,” in the last December number of the *Contemporary Review*, should be read by all Americans as well as by all Englishmen, at this time. His earlier article in the same review (September, 1901) on “The Wars of the Future” is the most striking statement in brief of the main principles of his great book; it should be printed as a tract and scattered broadcast up and down the land. Another powerful statement of his position has appeared in our own *North American Review* since his death (April, 1902).

Bloch was not only present at the Hague during the Conference, but at Paris during the Exposition, always indefatigable in his work of enlightenment. When necessary he took the platform; and so it was that we had the privilege of seeing and meeting him when he came to London last summer to deliver his lectures on the Transvaal War before the Royal United Service Institution, to which I have referred. After one of these lectures he invited us to a personal meeting; and at this meeting he unfolded with great earnestness his scheme for having established at several of the world’s leading centres what he called War and Peace Institutions. These were to be large mu-

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seums, in which, by pictures, panoramas, models, charts and many means, the real character and significance of modern warfare should be brought home to the actual perception of men and women, who now for the most part have no adequate comprehension of what war is. Especially did he wish to have the practical and economic aspects emphasized, to make men see how and why, in the changed military conditions, a really successful war on the part of one great power upon another really great power is impossible.

At the time of his death M. Bloch was actually engaged in the establishment of the first of these remarkable museums at Lucerne; and he provided for its generous endowment. He chose Lucerne as a point to begin, since it is a place so much visited, and he felt that the knowledge of the work would spread thence to all the world, and the work be largely copied. He had secured a large and imposing building at Lucerne and was prosecuting the work of preparation at large personal expense; for M. Bloch was a man of great wealth, and put much money, as well as thought and zeal, into his peace propaganda.

He was anxious that what he was planning in Lucerne should also be done in London; and he gave me a long typewritten outline of his scheme to submit to William Mather, George Cadbury and other leading peace men in England, whose coöperation might be enlisted. I believe that London will yet have such an institution. I sincerely hope that America will have such a one; and this was M. Bloch's earnest desire. He spoke of New York and Washington as appropriate locations; and in one of these cities, through the munificence of some one of our haters of war and lovers of peace, who could certainly put a half million dollars to no more useful or necessary service to-day, this institution should surely rise and continue to teach its lessons until they are no longer needed.

I wish that it might be founded now, while the workers for peace through all the world are mourning for Bloch, as a strong assurance that his work and

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influence shall be perpetuated and shall grow. I wish that in memory of him it might be called simply *The Bloch Institution*. I wish that the things which he suggests in the outline which he prepared, and which I hope will soon be published, might all be carried out; and I wish that, in sympathetic hands, catching his great inspiration, the institution might be developed with a fulness of which even he hardly dreamed. I wish that one great hall might be devoted to copies of all of Verestchagin's pictures, and that other halls might serve similar ends. I wish that year by year addresses might be given at the institution by the world's best thinkers in behalf of a rationally organized world; that peace and arbitration conferences might there be regularly held; that from that centre all the world's best literature upon this commanding interest might be widely circulated; and that useful publications might there have their source. I can think of no institution that would be of greater service in America at this time. I can think of no worthier monument which we could rear to Jean de Bloch. His noblest and immortal monument he has himself created in his great work on "The Future of War."

EDWIN D. MEAD.

PART I
MILITARY AND NAVAL DEVELOPMENTS

CHAPTER I

HOW WAR WILL BE WAGED ON LAND

IN former times bullets, for a great part of their course, flew over the heads of the combatants, and were effective only for an insignificant distance. The modern bullet will strike all it meets for a distance of 660 yards, and after the introduction of the more perfect arms now in course of preparation the effective distance will be as great as 1210 yards. And as it is most improbable that on the field of battle it will not meet with a single living being in such a distance, we may conclude that every bullet will find its victim.

The old powder was a mechanical mixture of nitre, sulphur, and charcoal, upon the ignition of which were liberated many elements which did not enter into new combinations. The new powder is a chemical combination which gives scarcely any smoke and produces no empyreuma in the barrel. At the same time the explosive force of the new powder is much greater than that of the old, and its quality of smokelessness or of giving little smoke, in the first place, renders it impossible to judge of the position and forces of an enemy by smoke, and, in the second, frees the marksmen from the clouds of smoke which formerly were an obstacle to aiming. And as in the opinion of many authorities the last word concerning explosives has not yet been said, in the war of the future, especially if it should take place some years from now, explosives of such strength will be employed that the concentration of armies in the open field, or even under the cover of fortifications, will be almost impossible, so

that the apparatus of war prepared at the present time may prove itself useless.

The improvement of small arms goes forward with incredible speed. By the almost unanimous testimony of competent persons, the changes which took place in the course of five centuries cannot be compared in importance with those which have been made since the wars of 1870 and 1877-78. The well-known specialist, Professor Gebler, made a comparison, expressed in figures, between different modern small arms, taking as his standard of effectiveness at 100 degrees the Mauser rifle, 11 mil., of 1871. On this basis he worked out the effectiveness of modern weapons as follows :

The modern French rifle	433
The modern German rifle	474
The new rifles in use in Italy and Spain	580
The 6-mil. rifle adopted by the United States	1000
The 5-mil. rifle now undergoing test	1337

Therefore, if in the war of 1870 the German and French armies had been armed with weapons of modern type, speaking theoretically, the losses in that war would have been $4\frac{1}{2}$ to $4\frac{3}{4}$ times greater than they actually were. Had they been armed with the 6-mil. rifle used in the United States of America the losses would have been ten times greater.

Nevertheless, specialists declare that the new weapons adopted in European armies, and even the 6 mil. rifle, are already obsolete, and that the future will see a self-loading weapon made out of an alloy of aluminium, from which a series of shots may be fired without taking the rifle from the shoulder or losing time and energy in reloading.

Experiments made in Belgium with the new self-charging rifles and pistols of the Mauser system show that (firing only such a number of cartridges as will fit into the magazine) a trained soldier can fire from six to seven times a second ; upon shooting a greater number of cartridges from a gun, which requires reloading, the maximum number of shots with the 6-mil. gun is :

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Without aiming	.	.	.	78 per minute.
Aiming	.	.	.	60 „

But the efforts to improve small arms do not stop there, and governments will continue to strive to lessen calibres, as is maintained by Professor Gebler, General Wille, Professor Pototski, and other authorities, to 4 and, it may be, even to 3 millimetres. It is true that there are great difficulties in the utilisation of such small calibres, but the successes already achieved by technical science may be taken to guarantee that these also will be surmounted.

Such a weapon will excel the present in efficiency even more than the present rifle excels the past. The diminution of the calibre of rifles to 5 mil. makes it possible for a soldier to carry 270 cartridges, instead of the 84 which he carried in 1877; the reduction of the calibre to 4 mil. would enable him to carry 380 cartridges; while with the reduction of the calibre to 3 mil. the number of cartridges borne would increase to 575. In addition, the levelling of the trajectory of the bullet would give to shooting such deadliness that it would be practically impossible to strengthen the fighting line with reserves.

Professor Gebler declares that these improved weapons will be forty times more effective than those used in 1870. From this must result the complete re-armament of all armies, if before that time limits be not placed upon the rivalry of the nations in preparation for war. For the re-armament of their infantry, Germany, France, Russia, Austria, and Italy would, by our calculation, be compelled to spend the immense sum of £150,800,000.

But, apart from future improvements in arms, it is easy to see with existing improvements the following consequences: (1) The opening of battles from much greater distances than formerly; (2) the necessity of loose formation in attack; (3) the strengthening of the defence; (4) the increase in the area of the battlefield; and (5) the increase in casualties.

It is enough here to cite some statistics as to the action of modern arms as compared with the arms of 1870-71 and 1877-78. Thus, the bullet of the Chassepot, the

Berdan, or the Prussian needle-gun fired from a distance of 1760 yards could not penetrate a human skull, whereas the bullet of modern low-calibre rifles at a distance of 3850 yards will penetrate the hard bones of an ox.

But many military writers declare that the improvement in small arms will be neutralised by the fact that rapidity of fire will deprive the soldier of coolness and capacity to turn to account the superiority of the modern weapon.

Let us admit for the moment that modern long-range rifles, even with their future improvements, will not prove more deadly in battle than their predecessors. Such an improbable and apparently unfounded proposition is directly refuted by the experience of the Chilian war of 1894. In that war the armies of the Congress were armed, partly with old, partly with modern weapons, and it was proven that each company of soldiers armed with rifles of a modern type put out of action 82 men in the armies of the President-Dictator, while a company of soldiers armed with obsolete weapons, put out of action only 34 men. The absence of smoke alone must increase immensely the deadliness of modern arms. The history of past battles relates that at a distance of sixty paces combatants often could not see one another, and that their fire proved ineffective. And even if long-range rifles do not prove more deadly than their predecessors, it will still be absurd to deny that a certain number of projectiles will disable a certain number of men. And as, in the wars of the present century, the number of shots fired for every disablement has fluctuated between $8\frac{1}{2}$ and 164, it is plain that the supply of cartridges now carried by each soldier is sufficient to disable at least one opponent ; while the supply of 380 cartridges with the 4-mil. rifle, and of 575 with the 3-mil. rifle, will be more than enough to disable two or three of the enemy. In other words, even supposing the effectiveness of modern arms to be in no way increased, the fire of one rifle may disable two or three of the enemy. From this it is plain that, even with the weapons now adopted, the effectiveness of fire presents the possibility of total mutual annihilation.

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Such is the comparison when regard is had alone to the increase in the supply of cartridges arising from the reduction of the calibre of rifles.

But in addition we must take into account the rapidity with which modern weapons may be fired. In a given time twelve times as many shots may be fired as in 1867, while the chances of missing fire and of injury to the powder by damp have been removed. In addition to this must be borne in mind the long range of modern weapons, the absence of the accumulations in the barrel of the rifle, the adoption by officers of instruments for precisely ascertaining distances, the use by under-officers of field-glasses, and finally, the substitution of the old powder by smokeless powder. All these conditions will undoubtedly increase the number of losses, and if the operation of each were considered as a factor in multiplying past losses, we should attain almost incredible but technically and mathematically trustworthy figures.

To this must be added the improvement, since 1870, in the instruction of soldiers in firing. In the training of soldiers every year an immense quantity of ammunition is expended. In addition, mechanical means are employed to show the direction of the barrel on aiming and firing. These are new conditions entirely, or in a great degree, unknown in the time of the last great wars. If we take into account the fact that 500 cartridges are prepared for every rifle, the expenditure of which, of course, is not stinted, we are confronted with a direct denial of the possibility, even for armies of millions of men, in the event of equal strength, to sustain such losses.

In addition to small arms the power of artillery has increased in a measure incomparable with the past.

A glance backward at the development of field artillery shows that from the date of the invention of powder improvements in arms took place very slowly. In imperfect weapons, it would seem, it would have been much easier to effect improvements. Nevertheless, to within a recent date, the effect of artillery fire remained very inconsiderable.

In 1891 Professor Langlois estimated the increase of

the power of artillery fire since the war of 1870 in the following manner : With an equal number of discharges, modern artillery will be five times more effective than the artillery of 1870. But as modern field guns are capable of discharging in a given time from two to two and a half more projectiles than the old guns, it follows that the power of artillery fire has multiplied since 1870 no less than from twelve to fifteen times.

The calculations made by Professor Langlois in 1891 are already out of date. In France, in Germany, and in Russia quick-firing guns are being made, and from the testimony of such authoritative writers as General Wille, Professor Pototski, and Captain Moch, we find that the fire of these new guns is at least twice as powerful as that of the gun of 1891, of which Langlois speaks in the following terms : "We have before us a whole series of improvements of the greatest importance, and must admit that munitions of war are entirely different from those in use in the past." So that in order to form some idea as to the total losses in a future war it is necessary to compare the action of the latest perfected arms with the action of the old guns employed up to the present time. Such a comparison only shows that, as in the case of quick-firing rifles, the past can give no precise forecast as to the effect of artillery in future wars.

With the introduction of smokeless powder and the employment of nickel steel on the one hand, and the strengthening by wire of the barrels of guns on the other, arms of tremendous power are being made.

A comparison of the result of the firing of a thousand rifle bullets by soldiers attacking in loose formation with the action of shrapnel, shows that one round of shrapnel is effective over a space double the length of that covered by a thousand rifle bullets, and not less in width. Experiment has also shown that the fragments of shrapnel disperse themselves over a space 880 yards in length and 440 yards in breadth. Prince Hohenlohe, commander of the German artillery in the war of 1870, in the most emphatic manner declared that "a battery placed against

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a road fifteen paces in width might annihilate a whole mass of infantry on this road for a distance of 7700 yards, so that no one would even think of standing there."

Not less are the successes attained in the improvement of projectiles. The use of steel in their manufacture permitted their being charged with a greater number of bullets. The use of explosives four times more powerful than were formerly employed gave to each splinter and bullet immense force. The flight of bullets and splinters may be likened to the action of a sieve from which drops of water are driven. Imagine such a sieve revolving at great speed, and some idea will be gained of the manner in which the fragments of shells would be dispersed.

In the war of the future, shell, which is much less effective than shrapnel, will be employed less than formerly. Shrapnel will be the chief ammunition of artillery, although if we believe French reports, it is proved that all in the vicinity of a bursting Brisant shell will be knocked down by the agitation of the atmosphere and sustain serious internal injuries, while in the case of the shell bursting in a covered space every one there will be killed either by the action of mechanical forces, or by the poisonous gases liberated by the explosion.

By a comparison of the effect of artillery ammunition with the effect of that employed in 1870, it is shown that, on the average, shells burst into 240 pieces instead of 19-30 as was the case in 1870. The shrapnel employed in 1870 burst into 37 pieces, now it gives as many as 340. An iron bomb weighing 82 pounds, which, with the old powder gave 42 fragments, filled with peroxydene gives 1204 pieces. With the increase in the number of bullets and fragments, and in the forces which disperse them, increases also the area which they affect. Splinters and bullets bring death and destruction not only, as in 1870, to those in the vicinity of the explosion, but at a distance of 220 yards away, and this though fired from a distance of 3300 yards.

With such improved ammunition the destruction pro-

duced in the ranks of armies will be immense. From the statistics furnished by the Prussian General Rohne, we have estimated the losses which would be sustained by a body of 10,000 men attacking in loose formation a fortified position. From this estimate it is shown that before the attacking party succeeded in covering 2200 yards in the direction of the defenders' trenches every individual composing it may be struck by bullets and fragments of shells, as the defenders' artillery in that time will have succeeded in firing 1450 rounds, scattering 275,000 bullets and fragments, of which 10,330 will take effect in the attacking lines.

But artillery fire will be directed not only against the attacking troops, which, when within range of the trenches may be destroyed by rifle fire, but also, to a greater extent, against supporting bodies which must follow in closer order, and among which, therefore, the action of artillery fire will be even more deadly.

And as at the same time the quantity of artillery in all armies has considerably increased, we may well ask the question whether the nerves of short-service soldiers will stand the terrible destructiveness of its fire.

The improvement, in all respects, of fire-arms, and the high degree of perfection achieved in artillery and artillery ammunition are by no means all that the mind of man has contrived as weapons of destruction. The whole series of auxiliary instruments which in a future war may have immense importance has, since the last war, been improved. Velocipedes, carrier pigeons, field telegraphs and telephones, apparatus for signalling by day and by night, and for illuminating the field of battle, photographic apparatus for the survey of positions from great distances, means of observing the movements of armies by the use of observation scaffolding, ladders, watch towers and balloons—all in a great degree do away with that insufficiency of information which formerly prevented united and successful operations.

As a necessary consequence of the increase in the

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power of fire, we find the more frequent and more extended adoption of defences, and cover for protection in attack and for hampering the enemy. Even in times of peace, positions are prepared for the defence of certain points of the railways and main roads and of water communications.

In addition to this in the future war every body of men appointed for defence, and even for attack—if it is not to attack at once—must immediately entrench itself. It must dig, so to speak, in the earth its line of battle, and, if time permit, must raise a whole series of defensive points, taking advantage of natural obstacles, and perfecting them with defensive works. Sheltered behind such works, and in a position to devote all their energy to fire against the enemy, the defenders will sustain losses comparatively slight, only their heads and hands—that is, an eighth part of their height—being exposed, while the attacking bodies will be exposed to the uninterrupted fire of the defenders, and deprived almost of all possibility of replying to their fire. For the construction of such trenches and earth-works, each division of an army is now furnished with the requisite tools.

In the opinion of competent military writers the war of the future will consist primarily of a series of battles for the possession of fortified positions. In addition to field fortifications of different kinds, the attacking army will have to deal with auxiliary obstacles which will be met with in the neighbourhood of fortifications, that is, in the very position where they will be subjected to the greatest danger from the enemy's fire—obstructions formed of beams, networks of wire, and pit-falls. To overcome these obstacles great sacrifices must be made.

The part of cavalry in a future war presents this primary difference with its part in the past. At the very beginning of war, and even before the attacking army has passed the frontier, it will be sent to make irruptions on the territory of the enemy, penetrating the country as far as possible, destroying communications, depôts, and telegraphs, seizing government resources, and preventing the concentration of

troops. After this the cavalry which follows as part of the constitution of the regular army will be employed in the making of reconnaissances. In a future war such duties will be undoubtedly more difficult than before, owing to the adoption of smokeless powder. Even after having determined the general position of an enemy, cavalry will hardly be in a condition to acquire any precise information, to determine his strength, and even the distance of his advanced posts. The pickets of the enemy will not stand in the open field, but under cover, behind eminences, groups of trees, and hedges. From a distance of a quarter of a mile the fire from the concealed pickets of the enemy will be very effective, yet the pickets themselves will be invisible. In all probability pickets will open fire at the distance of half a mile, to prevent the closer approach of the reconnoitring party, and as with modern arms horsemen may be picked from the saddle from a great distance, the patrol will be unable to determine the distance of the enemy by the effect of his fire. With modern arms and smokeless powder a single marksman in a sheltered position may cause serious loss to a body of troops, as witness the case cited in the "Military Album," when in an attack by Bavarians on a French battalion sheltered behind a low wall, a Bavarian soldier climbed into a tree, and picked off the French at will, while no smoke betrayed him, and several volleys failed to kill the daring marksman.

Thus scouting parties will be forced to move with great caution, and will not always be able to collect sufficient information, all the more so because, having come under the fire of insignificant posts, and having been obliged to withdraw, they will naturally not wish to admit that they were engaged with small numbers of the enemy. More precise information may be attained only by means of infantry commands which are more easily sheltered, and which can approach more closely the positions of the enemy. Such a definition of the duties in reconnaissances of cavalry patrols and infantry commands is laid down in the Instructions for Infantry elaborated by the French technical committee: "Cavalry may obtain only general,

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approximate information as to the position and strength of the enemy; for the acquiring of detailed and precise information infantry must be employed." And actually, in the French military manœuvres, cavalry are now kept at some distance, and close reconnaissances are made by infantry. Nevertheless, the reconnoitring importance of cavalry, in the strategical sense, has increased. It must be taken into account that the territory of the enemy will be sown with a multitude of permanent and improvised fortified positions and points, and an army will not attack without having around itself, and more particularly in advance, a network of cavalry detachments split up into small parts and patrols. To a large extent such cavalry will operate independently, as when crossing the frontier in the beginning of war. It must alarm the enemy, destroy or seize provisions, guard the bridges, seize despatches, collect information as to the enemy's movements, and protect the communications of the army in its rear.

The greater the importance played in modern war by railways, telegraphs, and improvised entrenchments, the more essential has become this strategical employment of cavalry. Military writers generally assume that the chief strength of cavalry must be sent forward for investigation, and for the protection of the advanced guards of armies, as Germans expressed by the German saying, "*Die Reiterei allzeit voran!*" (Horsemen always to the front). In view of the power of modern arms, and the resulting practice of disposing troops behind natural and artificial defences, and in view of the great network of defensive points prepared in advance, an attacking army will more than ever find it necessary to feel its way, and to reconnoitre the country into which it is advancing. Thus the capacity of cavalry as the "feelers" of an army has become especially important.

As to the part cavalry should play in actual battle, military writers differ in a remarkable degree. Some, as the French Captain Nigot, believe that the desperate massed attacks of cavalry, which prove so effective in manœuvres, are impossible, as with the great increase in the power of fire, cavalry will not be able to strike at infantry even when

weakness is observed. From his calculations it appears that a battalion of 800 rifles, with one volley fired at a range of 330 yards, would unhorse 424 troopers, and if a battalion were to open fire at 880 yards, and continue firing, at a distance of 110 yards 2656 men would have been put out of action, that is several battalions of cavalry, attacking one after another.

Such is not the view of all military writers. Thus one author, relying on the fact that cavalry will cover a given distance at twice the speed of infantry, contends that although cavalry is subjected to treble the possibility of disablement, yet one factor neutralises the other, and therefore the loss of cavalry will be no greater than the loss of infantry in the same distance.

Of one thing there is not the slightest doubt, that is, that cavalry is threatened with treble probability of being struck. In France it was shown that under equal conditions cavalry losses under fire are from two and a half to three times as great as infantry losses, and that cavalry cannot, therefore, remain immovable under fire. Therefore, in France it is considered proven that in time of battle cavalry must keep at a distance of not less than 3850 yards from the enemy, and may draw nearer only towards the close of the battle. Otherwise it would be swept away by rifle and artillery fire.

The speed at which cavalry may attack is taken by some at 550 yards a minute, but most authorities limit it to 440, even to 374, yards a minute. But even if, notwithstanding inequalities of the battlefield and the close formation which lowers the general speed to the speed of the slowest horses, the speed of attack is taken as half a mile in two minutes—almost racing speed—nevertheless, in the course of these two minutes' exposure to effective fire before it can get to close quarters with infantry, cavalry must suffer immense losses which will force it to disperse or make its attack feeble.

It must be understood that for the consideration of this question we have only the opinions of different military specialists. The German author of the "Militärische

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Essays" says that modern conditions in no way involve the fascination which surrounds cavalry in the traditions of the Seven Years War, and that the German army would enter upon war with from 30,000 to 40,000 superfluous cavalry, which would only create difficulties in concentration and to the Commissariat. But other authorities declare that the smokelessness of the battlefield will be favourable for cavalry attack, since it will be easier seen at what points the enemy's infantry is weak, while it will be more difficult for infantry to await from afar, without the covering of smoke, the impetuous shock of masses of cavalry.

This moment when weakening is observed in the enemy's infantry is relied upon by the advocates of cavalry attack in battle. One even goes so far as to say that upon the clash of cavalry upon infantry "it will matter nothing what may be in the hands of the trembling infantry—magazine rifles, flint-locks, or simply pitchforks." But, as Von der Goltz observes, weakness may be very plain in the ranks of an army and yet not be seen by the enemy. Such weakness can only be seen from advanced positions, and while the information is being conveyed to the proper quarter and cavalry is being sent to attack, the auspicious moment may have passed. On the other hand, the movement of masses of cavalry is always visible owing to the dust it raises, and all the fire of the enemy may be concentrated on these masses, artillery fire against cavalry being effective from a long range, as the mass presents an immense target.

In comparison with the times of the Seven Years War cavalry has itself made progress. It is furnished with stronger and swifter horses. But this improvement can in no way be compared with the increase in range and rapidity of fire. In addition to this, as the same author observes, in former times it was sufficient to break up thick masses of infantry and their opposition was at an end; now infantry begins the battle in loose formation, each individual command constitutes a unit fit for battle, and even the solitary soldier will not lose his wits while a

cartridge remains upon him. Thus the relations between cavalry and infantry have entirely changed.

It is questionable, indeed, whether in the future cavalry will have that importance which formerly belonged to it, as a force deciding battle and afterwards completing the overthrow of the enemy by pursuit. Even in the wars of 1870 and 1877 this importance of cavalry seemed diminished, although, on the other hand, its importance in the reconnoitring of occupied territory, the protection of armies, and its value in independent action have increased.

In addition to this, a new function for cavalry has been created—immediate irruption into the territory of an enemy, and the destruction of his arrangements for mobilisation, and his communications. To what extent such action of cavalry in the moment of the declaration of war will prove successful is still to be proven by experience. In the event of success such action would cause disorganisation in the enemy's arrangements, and force him to accelerate them. And as operations, considering the immensity of modern armies, may be successfully carried on only by the precise execution of strategical plans elaborated in advance, then the disorganisation caused by sudden cavalry irruptions might have the most important results.

As concerns the *rôle* of cavalry in pursuit, it is more important to consider this *rôle* in the pursuit of retreating armies to their farthest movement than in the pursuit of armies in their actual retreat from the field of battle. Doubts have been expressed as to the decisiveness of future battles. It is very probable that in the majority of cases the road selected for retreat will be guarded by defences constructed in advance, the retreating army falling back upon the nearest position and offering fresh resistance to the victors, who, on their side, will be weakened by the storming of the first positions. In such case the most important *rôle* of cavalry may be to prevent the retreating army drawing reinforcement from other sections of the army which, owing to the vastness of the

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field of battle, may find themselves at considerable distance from the main army.

In any case it will be seen that the duties of cavalry in war remain very important, although the fulfilment or non-fulfilment of some of the tasks appointed for it has still to be shown by experience.

Quite otherwise is the case of artillery.

It is an accepted axiom that without the aid of artillery it is impossible to drive infantry, even infantry considerably weaker in numbers, out of a fortified position; and as all infantry when acting on the defensive will be entrenched, then armies in future will find themselves mainly dependent upon artillery.

The successful employment of artillery will depend upon the opposition it meets from the artillery fire of the enemy. The artillery of the attacking side will begin by attempting to silence, or at least to weaken the artillery fire of the defenders, which object being accomplished, it will be able to turn its attention to the enemy's infantry. The artillery of the defending army, possessing as it will many advantages, will attempt to prevent this. The result of such a duel, if the defenders have artillery of nearly equal strength and quality, in all probability will be the annihilation of the attacking artillery; while if the superiority of the attacking artillery be substantial, the result will more probably be mutual annihilation.

The increase in the artillery of all armies, the improvement of ammunition, the adoption of smokeless powder and of new explosives, the improvement in tactics, all these must lead to such great losses in the artillery service that their action will be paralysed, or the losses in the armies will become so tremendous that war itself will be impossible.

Such a conclusion may seem risky, but it is founded on the investigations of the most competent artillerists, and in the justice of their conclusions it is difficult not to concur, when we consider the changes which have taken place since the time of the last great war.

As relates to the employment of artillery, it may first of

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all be noted that the adoption of new powders has changed for the worse the position of artillerymen. In former times a thick cloud of smoke hampered the aim of the artilleryman. But on the other hand it prevented the enemy's artillery and infantry from taking accurate aim.

As long as ordinary powder was used there was no especial need for increase in accuracy and rapidity of fire, for quick firing produced so much smoke that after a short time it was necessary to slacken fire, except on those occasions when there was a favourable wind ; and accuracy also was not as important as it is at the present day. With smokeless powder it is possible to discharge more shots in a few minutes favourable for fire than were formerly discharged in a day's battle. In this connection the accuracy of modern fire must again be insisted upon. Cannon at a distance of 2011 yards has placed shot in the same hole four times in succession.*

It must be borne in mind that against the enemy's artillery the defending army will make use also of sharpshooters. Using the new powder, sharpshooters will have full possibility to approach the batteries of the enemy, and concealing themselves behind inequalities of the field of battle, with no smoke to betray them, may pick off all the enemy's gunners and horses.

Manceuvres in which smokeless powder has been used confirm the opinion that from a distance of 440 yards it is impossible to discover marksmen hidden behind trees or bushes. But from this distance every shot of a skilful marksman will claim its victim. In addition to this, all armies now possess specially organised bodies of chasseurs, trained to fire from great distances, and accustomed stealthily to approach their mark. It is plain that for such commands there can be no especial difficulty in stealing up to a battery and picking off the artillerymen. The French, German, and Austrian armies dispose of sufficient numbers of such soldiers. It is well known that Germany, France, Austria, and Switzerland yearly expend considerable sums

* Löbell, " Militärische Jahresberichte," 1894.

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on the encouragement of good shooting, and that among the population of those states there is a considerable number of first-rate shots. In the Russian army chasseur commands are also found with the different army divisions.

According to the data of the Prussian General Rohne 100 sharpshooters will put a battery out of action, firing from a distance of—

880 yards in the course of 2.4 minutes.					
1100	"	"	"	4	"
1320	"	"	"	7.5	"
1650	"	"	"	22	"

But even if the destruction of the gunners be not accomplished by sharpshooters, it is very probable that it will soon be done by the artillery of the enemy.

The quantity and power of artillery in all armies has been multiplied many times. If the figures which represent these increased quantity and increased power be multiplied it will be shown that in comparison with 1870 the strength of the French artillery has been multiplied 116 times, and of the German 42 times. But after the introduction of the improved artillery now being accomplished the strength of artillery will be again redoubled.

If, to form some idea how losses in a future war from the action of artillery alone will exceed the corresponding losses in 1870-71, we multiply the figure of these latter losses by the figures which represent the increased force of modern artillery, the result would be incredible, for it would show that there could not be an army large enough to sustain such losses. But for the purpose of giving an idea as to the power of modern artillery these figures have a theoretical value, resulting as they do from simple arithmetical calculation.

In one sense calculation will not be uninformative. What number of soldiers will be disabled by the use of that quantity of shots which is found in the ammunition cases of the batteries of different countries, taking into account the conditions for marksmanship less favourable in war than in peace? When we make this calculation,

on the figures of the Prussian general and well-known military writer Müller, we find that the ammunition carried by the batteries of the French and Russian armies, taken together, would put out of action six millions of soldiers. Continuing our calculations upon the data of the same authority we find that the Franco-Russian artillery, with its ready supply of ammunition, would be capable of withstanding the attack of double that number, or twelve millions of men. The ready supply of ammunition in the united German, Austrian and Italian armies would disable five millions of men, and successfully repulse the attack of ten millions of infantry.

A writer no less authoritative, a professor of the chief artillery school in France, Colonel Langlois, speaking as to the character of future battles, expresses the opinion that for one field-piece up to 500 rounds will be required. If we estimate the quantity of artillery, and the number of fragments produced by explosion, it is shown that these are sufficient for the destruction of forces eight times stronger than the armies opposed to them. It is necessary to mention here that modern projectiles, filled with powerful explosives, will be dangerous not only to the enemy, but also to the army which employs them. The storing, transport, and employment of such explosives under the well-directed fire of an enemy may lead to catastrophes which will still further increase the horrors of war. In France *fougasse* shells, containing 4 pounds of melinite, have been adopted. The majority of writers are agreed that in view of the possible premature explosion of melinite shells, *fougasse* shells are very dangerous, as in such event, the bursting of the gun seems inevitable. But the danger is not limited to the possible bursting of guns. Against entrenched armies, mortars and siege artillery of great size will be employed. The projectiles of these will be filled with strong explosives, such as peroxylen and melinite. Now these explosives are capable of exploding unexpectedly on certain changes of temperature and from other causes not yet ascertained. The agitation of the air caused by the enemy's shells may also cause explosions.

